Whittlesey. Outline sketch of the geology of Ohio

****Outline Sketch of The****

Geology of Ohio

By

Charles Whittlesey

OUTLINE SKETCH OF THE GEOLOGY OF OHIO.

COMMUNICATED FOR THIS WORK BY CHARLES WHITTLESEY, OF THE LATE GEOLOGICAL CORPS OF OHIO.

In the state of Ohio, no primitive rocks are found in place. Her rocks are all sedimentary and stratified, and as they are nearly horizontal, the strata that appear at the surface are few. Her geology is, therefore, very simple and easily understood, especially when we compare it with that of Pennsylvania and New York, where a much greater variety of formations is seen.

The lowest visible rock in Ohio is the "blue limestone" of Cincinnati, which is also the lowest in a physical, as well as in a geological sense.

The bed of the Ohio river, near Cincinnati, is 133 feet below the level of Lake Erie, and is the most depressed portion of the state of Ohio, being only 431 feet above tide water. Here the blue limestone is seen, with its beds of "dun" and "blue" marl. The strata dip in all directions from the south-western angle of the state, which occupies a crown, or geological summit, rather than a synclinal axis.

Any one would be convinced of this by travelling from thence in any direction and observing the rocks. If he should go up the Ohio river, he would perceive that the surface of the blue limestone descends, and finally passes beneath its channel at a distance of less than 100 miles. In the same way, on descending the river, he would discover the hills about Madison, in —— county, capped by a different rock, the "cliff limestone," which overlies the "blue," and arriving at the falls of the Ohio, at Louisville, the "cliff," continually sinking, reaches the bed of the river and causes the falls. Go up the Great Miami to Dayton, and the cliff makes its appearance, although the descent in this direction is slight. A part of the disappearance of the blue is here owing to the rise of the country. In the same way, if one passes up the valley of the Licking or the Kentucky rivers, the overlying cliff settles down into the level of the blue, and apparently occupies its place in the horizon.

We have no means of ascertaining the thickness of the blue limestone, for we have not penetrated through it to the rocks beneath; yet it is estimated at more than 1000 feet, 600 to 700 of which are visible.

If we group the rocks of Ohio according to their lithological characters, there are *five distinct divisions*, that any person will discover on examination. The difference in appearance, hardness, color and composition is so marked that no more natural division could be made.

1st.	*Limestone*, visible thickness in Adams county, according to Dr. Locke,	772 feet.
2d.	*Black shale*, thickness at the same place,	251 "
3d.	*Fine grained sandstone*, thickness,	343 "
4th.	*Conglomerate*, "	200 "
5th.	Coal series, " estimated,	2000 "
	Thickness in Ohio,	3566 "

This is dividing the rocks, not according to strict geological rules, but according to external characters.

A person travelling from the west line of Adams county eastward, to the Little Scioto, in Scioto county, would pass over the outcropping edges of all these rocks, and would see all the formations of Ohio.

They here plunge in the direction south 80½° east, and sink to the eastward at the rate of 37 4-10 feet per mile ;* consequently, the cliff limestone, the upper member of the great limestone deposit, which, at West Union, Adams county, is 600 feet above the river at Cincinnati, at Brush Creek, 6 miles east, is found only about 350 feet above the same level.

And the fine grained sandstone which caps the hills east of Brush Creek, and west of the Scioto, as we approach the Little Scioto, sinks to the base of the hills and appears beneath the conglomerate. This inclines continually to the river surface, and plunges beneath the coal.

In other parts of the state, as will be seen hereafter, although the same rocks prevail, and always in the same order, their thickness, mass and dip will be different. There is no place where they can all be seen in so short a space as in Adams and Scioto counties, and here Dr. Locke made his section in 1838.

As we proceed along the outcrop of these strata, by which is meant the irregular line of junction between the faces of the strata, we find that, in a level country, it coincides with a horizontal line separating one rock from another; and following the union of these rocks—for instance, the black shale and the fine grained sand stone—to the northward, we shall observe a *change* in the *direction* of the line of bearing, and also of the dip or plunge.

Rockville, Waverly, Chillicothe, Reynoldsburg, Mansfield and Newburg, are towns in or near the western edge of the "fine grained sandstone," or at its "outcrop," forming a continuous, but crooked line from the Ohio river to Lake Erie. By the attached map of the state, the fine grained sandstone will be seen to occupy an irregular belt about 10 miles wide, embracing those places. Next, westerly, is a strip of the black shale accompanying the fine grained sandstone, somewhat broader, and bounded by it on the east. On the west of the whole, and covering about one-third of the state, in the west and northwest, is the cliff or buff-colored limestone.

In the southwest corner, is the blue limestone, occupying a circular space from West Union, by way of Dayton, to the state line.

On the east of the line of towns above given, is the conglomerate, bending around from Cuyahoga falls to Benton, in Geauga county, and then eastward into Pennsylvania. Adjacent to this line of outcrop, are the coal bearing rocks, occupying the east and southeastern part of Ohio, within a line from Sharon, on the Pennsylvania line to Ravenna, Akron, Wooster, Dover, Brownsville, on the National road, Logan and Hanging Rock. If we examine any of these rocks over large tracts of country, at points 10, 40, or 100 miles apart, we soon discover that the line of outcrop changes in direction, and with it the line of greatest dip or plunge, which is at *right angles* to the line of bearing.

Thus, from Rockville to Chillicothe, the course is north, about 10° east, and corresponds very nearly with the line of outcrop of the fine grained sandstone for that distance. The dip at Rockville is given at s. 80½° east, almost a right angle, and the rate of dip 37 feet per mile. At the other end of

* 2d vol. Ohio Geo. Report, page 238.

the line, at Chillicothe, the general dip, rejecting fractions, is south 70° east, 30 feet to the mile, the line of bearing thus makes a curve to the *eastward*, and the line of dip a corresponding change to the *southward*. This is the universal law; consequently, when we course around the edge of the coal basin to the northward, and the line of bearing changes to an almost *easterly* direction, the dip is nearly *south*. It would be thus, if we should make the

Outline Map of the Geological Formations of Ohio.

entire circuit of the great Alleghany coal field. Pursuing its northern boundary through Meadville, in Pennsylvania, we should soon turn southward, and, arriving at the Portage summit railroad, should observe the lowest bed of coal there at the door of the station-house, on the summit of the Alleghanies, 2500 feet above the ocean, it would be found plunging rapidly to the *westward*. Following down the Alleghanies to the southwest, through Pennsylvania, Virginia and Tennessee, to the southern termination of this great coal bason, the rocks and the coal strata are found to dip more and more to the northward, and finally, at the flexure of the course, when we turn back to the north, the dip changes from north to northeast. Continuing on northward, on the west side of the coal field, through Tennessee, across the Cumberland and Kentucky rivers to the Ohio, we come to the starting point, the dip being northeasterly, easterly, and finally south of east.

These lines of dip point to a common centre, or depression in the strata, at the foot of the western slope of the Alleghanies, in Virginia.

In farther illustration of the geological map, it should be said that the scale is too small to give the exact outlines of the formations, even if they were exactly known. In the northeastern part, I have attempted to show the limits of the strata, but without success, owing to the limited scale of the map. For instance, much of the county of Medina is represented as being a conglomerate rock at the surface ; but the streams, particularly the south branch of Rocky river, cut through the conglomerate and reach the fine grained sandstone beneath. It is the same with Rocky, Cuyahoga, Chagrin and Grand rivers, and Ashtabula and Conneaut creeks. The shale and this sandstone, therefore, extend in narrow bays up the valleys of these streams and their branches. Between the fine grained sandstone and the conglomerate, is a mass of coarse grained sandstone, without pebbles, which furnishes the grindstones of Lake Erie, extending from the Vermillion river, through Lorain county and Cuyahoga, into Lake county ; but where it terminates I do not know. At Newburg, Warrensville and Chagrin falls, the section of this intermediate mass is as follows—beginning at the top of the fine grained sandstone :

1st. Black shale, with thin layers of sandstone, . . . 10 feet.
2d. Red shale, very soft, ... 30 "
3d. Grindstone grit, ... 40 "
4th. Shale, ash color, and layers of sandstone to lower face of conglomerate, ... 81 "

In Lorain county, the coarse sandstone grit appears almost to displace the fine grained sandstone and red shale—thickening downwards at Elyria to the black shale. Farther examination is necessary to classify these intermediate strata.

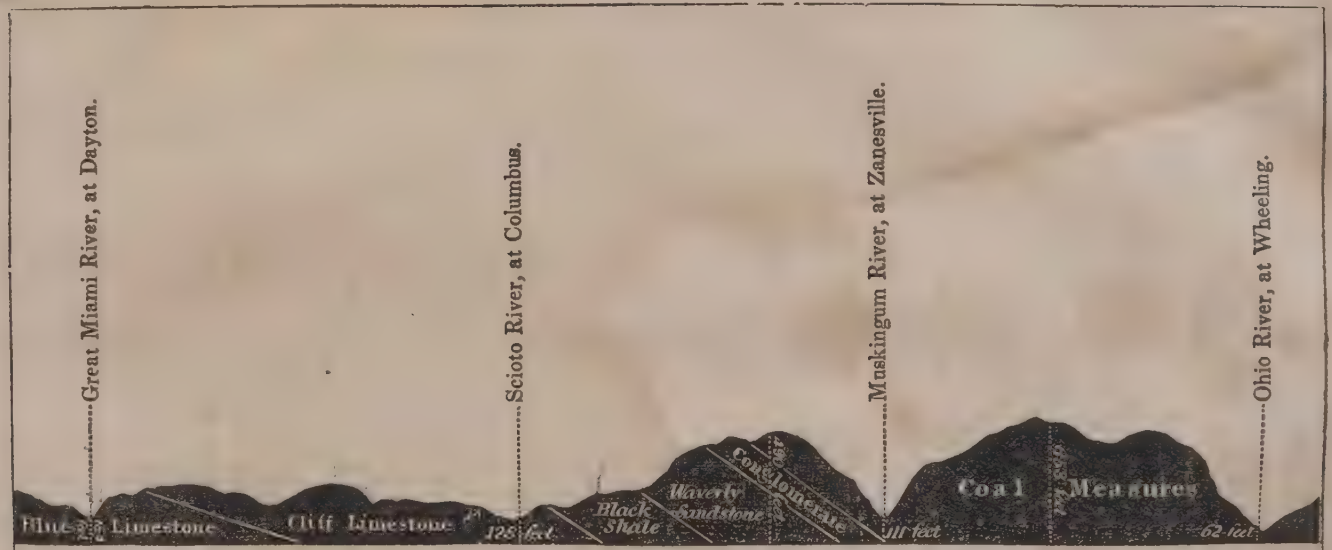
The projecting ridges of highland between the Black and Cuyahoga rivers, the Cuyahoga and the Grand and Mahoning rivers, are composed of conglomerate, as the surface rock, its most northerly point being an outlier, called the little mountain, within 5 or 6 miles of the lake at Kirtland, and elevated 600 feet above it.

The grindstone grit, red shale and ash-colored shale vary much in thickness, and at the south of Elyria, owing to the drift, it cannot, without farther examination, be decided where they cease, and where the fine grained sandstone rock may be first seen. In the valley of the Cuyahoga, they are seen distinctly at Brandywine Mills, and at the Peninsula in Boston ; and between Peninsula and Old Portage, appear to run out and to be lost in the shaly portions of the fine grained sandstone.

So with the narrow belt of fine grained sandstone overlying the shale, or black slate formations, and skirting the highlands that overlook the lake, it is not easy to determine the line of division between the two formations, particularly in the valleys of Grand river and the Mahoning.

Returning to the consideration of dip, a few instances more may be given, to show the surprising regularity of the sedimentary rocks of Ohio, and also the change in direction which has just been noticed.

Take the town of Chillicothe, in Ross county, the village of Newburg, in Cuyahoga county, and a point in the west line of Crawford county, all situated at the surface of the "black shale"—these three points form a triangular plane of stratification, of which we know mathematically the relative elevations and the distances. By a trigonometrical calculation, we deduce the "line of bearing" and the "dip" of this rock, or the plane of its superior face. The result is as follows : course of dip S. 59½° east ; bearing N. 30½° east.



Lake Erie Level, 564 feet above the Ocean.

SECTION OF THE ROCKS OF OHIO,
ALONG THE NATIONAL ROAD FROM DAYTON TO WHEELING.

Taking three points in the lowest bed of coal, Tallmadge, Youngstown and Sharon, we obtain for the bearing, N. 77½° east; dip, S. 12½° E.; amount, 20 6-10 feet per mile. These results, therefore, are not surmises and speculations, but physical facts, arrived at by measurement.

A "geological section" is an imaginary vertical cut, made through the rocks on a line of dip or greatest inclination; and since this line, in Ohio as elsewhere, is constantly changing, the section made at any place does not represent the bearing or plunge of the rocks at others, but only their order of superposition.

A general section is here given, extending from Dayton to Columbus, Zanesville and Wheeling, taken from the geological reports of Ohio. It shows all the general formations of Ohio, but on a scale so diminutive, that the subordinate members, or subdivisions of the formations do not appear. This would require a plan many feet long.

To comprehend this section fully, it is necessary to imagine the cut made along the line indicated, and one half of the mass removed, so that the observer has a view of the edges of the strata.

On a scale so limited, it is necessary to reject a very important member of the geological column, the "drift," "superficial materials," or "diluvial deposits," as it is variously named: a coating of earth, gravel, clay, stones and boulders, that overspread the whole country, hiding the rocks from view. This will, however, be touched upon in its place.

The relation between the horizontal and vertical distances must, of course, be disregarded in the scale here adopted; for if it was obscured, the elevations would be comparatively nothing, and little could be shown. The consequence of this disproportion is, to make the angles of dip appear much *greater* than they really are, bnt this cannot be avoided.

The horizontal line represents the level of the lake, and the irregular line above it, the surface of the earth, the elevations of which are in figures at a few points. As a survey has been made along the National road, this can be done with great accuracy.

The order of strata is here seen to be the same as given above. Near the west line of the state, or the section, the dip is slight. It is probably greater in a northerly direction. It is not very rapid between Dayton and Columbus, but increases materially between Columbus and Zanesville, in crossing the rocks between the limestone and the coal.

Dr. Locke gives the dip, at Montgomery and Miami counties, at N. 14° east, 6 feet per mile. At Columbus, I found it to be, S. 81° 52′ east, 22 feet 73 hundredths per mile.

The thickness of these formations is very variable at different points. The "fine grained sandstone," at Newburg, is not to exceed 80 feet in thickness, at Reynoldsburg and Jacktown about 500 feet, at Waverly 250 to 300 feet, and at Brush creek, Adams county, 343 feet. The "black shale" is more uniform, being at Brush creek 251, Alum creek 250 to 300, in Crawford county about 250. At Newburg, and alone the lake shore, its thickness is unknown.

The conglomerate is more irregular. In Jackson county, by estimate, 200 feet; in Licking county 100; Cuyahoga falls 100 to 120; Burton, Geauga county, 300.

The great limestone formation is divided into several numbers. At Cincinnati, at the bed of the river, there is—

1st. A blue limestone and slaty marlite.

2d. Dun colored marl and layers of lime rock, . . 250 feet.
3d. Blue marl and layers of blue limestone, . . . 160 "
4th. Marl and bands of limestone, with immense numbers of shells to surface.

In Adams county, the detailed section is thus—

1st. Blue limestone and marl,
2d. Blue marl, ... 25 feet.
3d. Flinty limestone, ... 51 "
4ih. Blue marl, ... 100 "
5th. Cliff limestone, ... 89 "

The coal measures of Ohio, like those of England and Pennsylvania, are composed of alternate beds of coarse grained sandstone, clay shales, layers of iron stone, their beds of limestone, and of numerous strata of coal. If the geological explorations of the state had been prosecuted, there is little doubt but the number of coal beds, or strata, lying one above the other, would have been shown to be as numerous as 40 or 45, and that there are 15 or 20 of them thick enough to be worked.

Here, as usual, the coal region is also an iron region. From Jacktown, on the western edge of our coal field, to Concord, in Muskingum county, in Mr. Foster's section, (2d Geol. Reports, p. 72,) a distance of about 42 miles, there are shown eight beds, or separate strata, of coal, and seven beds of limestone.

In my section, (2d Report, p. 57,) from Freedom, in Portage county, to Poland, in Trumbull county, about 35 miles, there are five distinct strata—three of them in places capable of being wrought. Among them are distributed three beds of limestone and many beds of iron ore.

Dr. Hildreth made a section of the hills at Dillon's furnace, Muskingum county, from the bed of the Licking or Pataskala river upward, 206 feet. In this vertical distance, there were four beds of iron ore, two of coal, and one of limestone.

But by far the greatest mass of coal and iron measures is composed of sandstone and shale. The beds of coal and iron are comparatively thin; the beds of sandstone from 10 to 20, and 80 feet thick; of shale, 5 to 50 feet thick. A bed of coal is considered workable, if the roof and drainage are good, when the thickness is *three feet.* If it is four feet, it is considered a good mine, and very few of them average five feet. Occasionally it increases to six, and, in one or two cases, to ten and eleven feet, for short distances; but for such extreme thickness the mine is certain to suffer, in consequence of its irregularity. The cases where a bed of the ordinary "heft" of four feet falls below that standard, are much more numerous than where there is a greater thickness.

In Lawrence and Scioto counties, in the distance of 30 miles, across the edge of the strata may be seen eight principal beds of ore, and new ones are being discovered. There are also four beds of coal and three of limestone.

The ore varies in thickness from 4 inches to 12, thickening up, in some places, to 2 feet; but this is an irregularity.

There are 17 furnaces, on the Ohio side, supplied with ore, flux and fuel to drive the engines, from the strata represented in the section. A large portion of the ore is taken from beds of a few inches in thickness, the rule being to strip a *foot* of earth for an *inch* of ore.

Sometimes beds of 2 or 3 inches are worked a few feet into the hill; but, in general, the valuable beds are from 4 to 6, 7 and 10 inches in thickness.

The calcareous ore, resting upon the second bed of limestone from the bottom of the section, being very rich, is sometimes obtained by drifting, but far the greatest part of it is procured by "stripping." The hills, or, more properly, the valleys of this region are so numerous, that the strata crop out, continually showing their edges to the miner along the slopes. Here he can follow the stratum into the earth till it becomes too deep, and then work along the side hill at the same level. The immense length of the line of outcrop for each bed, in a country completely intersected by hills and valleys, can easily be imagined. If, instead of being uneven and hilly, it had been flat, the strata remaining as near horizontal as they now are, it will be readily seen that none but such as are thick enough to "drift" would be worthy of attention.

Among the iron beds, there are but two or three that would, at present, pay for working by drifting. The ores are not all of them fit for use, in the present state of metallurgy, on account of silicious impurities that render them hard to melt; but the exceeding value of this region is caused by the general goodness of the ores in relation to ease of reduction.

There are many parts of the United States where richer ores may be found, and in thicker beds, but probably none where iron may be produced with as little fuel as on the Ohio river. They range from 30 to 40 per cent. of iron, and are so happily tempered with calcareous and aluminous matter, that they require a small amount of flux. But where a flux is needed, it is found everywhere in the limestone beds which nature has interspersed with the other mineral strata.

The abundance of these materials will appear from an examination of the section.

The iron interest of Ohio has materially improved since 1837. At that time, it was thought to be a good yield if a furnace produced 3½ to 4 tons per day. This was with the old-fashioned cold blast. In 1829, an improvement was introduced at the Clyde works, Scotland, by Mr. Robert Neilson, of Glasgow, which consists principally in using a blast of *hot*, instead of *cold*, air. Mr. Dunlop, of the Clyde works, and Mr. Dixon, of the Calder iron works, improved upon Mr. Neilson, by raising the temperature of the blast from 300 to 600 degrees, Fahrenheit. This improvement did not reach Ohio until 1841–2, although it was recommended by Dr. Hildreth in his Geological Report of 1836. The result is, an increase of product of nearly one-half, raising the daily yield from 3½ to 5, 6, and even 7½ tons per day, diminishing the consumption of charcoal, per ton, from 250 bushels to 160 or 180.

In April, 1844, Mr. Gliddon, the master and owner of the "Franklin Furnace Junior," Lawrence county, Ohio, gave me the yields of his furnace during a blast of 8 months, 1 day and 4 hours, commencing May 8th, 1843, at 1845½ tons of 2268 pounds, or 7 tons 65 hundredths per day. Charcoal per ton, before the hot blast, 210 bushels; for this blast, 161 bushels. Stone coal per ton, for engine and hot blast, 18 bushels and 9-10ths of a bushel. cost of ore per ton of iron, $3.17; the amount of ore, 2 tons 54-100ths.

The saving in charcoal of 49 bushels, at $1.75 the hundred bushels, is 85½ cents per ton. But the great item is in the labor, the same hands turning out about 40 per cent. more iron.

There is scarcely a doubt but the cost of iron may be still more reduced by the use of *mineral coal*, in whole or in part, in the place of charcoal; an experiment now going on in the counties of Summit and Mahoning with apparent success.

When these expectations shall be realized, it will be seen by a due consideration of the extent of the mineral region of Ohio, its richness in all the materials of value in the manufacture of iron, that this state will soon turn out immense quantities of that metal.

By the census of 1840, she had 72 furnaces, which produced 35,236 tons of pig metal the year previous. She had 19 forges, that made 7,466 tons of bar iron in the same time.

In this notice of the Ohio strata, I have not spoken of them by the scientific divisions and names, because their place and nomenclature in the system is not yet well settled among geologists.

The geological survey of the state was abandoned by the legislature when it was about one-third completed, and upon the work done no *final* report was made or required. The survey was dropped by the sudden withdrawal of the funds, the corps never having been formally disbanded.

Two annual reports were made, but not anticipating the abandonment of the survey, they contained only such facts as appeared to be of present practical value, reserving the theoretical and purely scientific matter for a future and final report.

Since that time, the splendid reports on the New York survey have been made, and as those geologists had a great range of observation, from the coal down to the primitive rocks, their classification has become, for the present, the standard for the United States.

In Ohio, many formations, well developed in New York, are *wanting*, leaving gaps in the series. Mr. Hall, of the New York survey, in his extended geological map of the western states, makes the blue limestone of Cincinnati equivalent to the Trenton and Birdseye group of New York members of the lower Silurian system, within two formations of the bottom of the sedimentary rocks. These are the "Potsdam sand stone," which rests on the primitive, and the "calciferous sand rock," lying between the Potsdam and the Trenton limestone.

In New York, next above the Trenton, is—1st, "Utica slate;" 2d, "Shawangunk grits;" 3d, "Hudson river group;" 4th, "Medina sandstone;" 5th, "Clinton group"—*all wanting* in Ohio.

Next above these rocks, in New York, is the "Niagara limestone," represented in Ohio, according to Mr. Hall, by the lower part of the cliff limestone, the upper part being here the geological equivalent of the "Helderberg limestone" of New York.

Between the Helderberg and the Niagara is found the "Onondaga salt group," of which only uncertain traces are found in Ohio. Our "black shale," which rests on the cliff limestone, represents the "Hamilton group" of New York, and the New York geologists discover in our fine grained, or "Waverly sand stone" the "Portage and Chemung group" of southern New York, which there plunges south and beneath the coal series, as it does here. Our conglomerate, underlying the coal, does not reach New York, but follows the edge of the coal field, as I have above described it, around through Pennsylvania, Virginia, Tennessee and Kentucky, back to Ohio.

The coincidence and equivalency of our rocks with those of New York cannot, in all respects, be regarded as settled. The fossils of the Ohio rocks, the great guide in classifying formations, have not been fully discovered or studied. The division of the fine grained sandstone into two members, equivalent to the Portage and Gardeau rocks, did not occur to the Ohio geologists, but may, notwithstanding, be a good division. There will, probably, be occasion to

divide the blue limestone into more members than are given above, when its multitude of fossils are completely understood.

An attempt was made at the meeting of the "Association of American Geologists and Naturalists," at Washington, May, 1844, by Professor H. D. Rogers, to adopt a system of names for the several formations, that should answer for the whole United States. Hitherto, the geologists of each state, following the example of those of England, have given to their strata the name of a locality or region, by which the same rock, when it crosses a state line, takes another name or designation. To make the science easy to learners and readers, and to give simplicity to the system among its professors, a nomenclature that shall be uniform in the United States, and even over the world, is indispensable.

The coal series of Ohio present no striking difference from the coal fields of other states and kingdoms, except in the presence of the "buhr stratum." All coal-bearing strata present alternate beds of iron ore, sand stone, shales, limestone and coal in their beds, and consequently changing frequently as we ascend or descend in the series.

In the 1st Geological Report of Ohio, p. 28, Dr. Hildreth notices the "calcareo siliceous," or "buhr stone rock," of the coal series of Ohio, which resembles very closely the French buhr," used in this country for mill stones, and imported from France. On Raccoon's creek, and at other places in the south, near the Ohio river, this rock is wrought into mill stones to a considerable extent; but millers, as yet, prefer the foreign buhr, at a considerably higher price.

In this brief view of the outlines of the geology of Ohio, I shall omit to notice the fossils, because upon this subject geologists are, as yet, only partially instructed.

The most numerous and striking are the trees, plants and stems of the coal-bearing rocks, the shells and corals and crustacea of the limestone, and the timber, leaves and dirt-buds of the "drift," or "diluvium." The latter is the general term for the earthy covering that conceals the rocks, varying in thickness from nothing to 200 feet.

It is sometimes called the "superficial deposits," having been brought on by some force, after the deposition and induration of the rocky beds.

There are many theories respecting the manner in which this immense mass of clays, sand and gravel was brought on, the discussion of which would occupy much space.

The "boulders," or lost rocks, that lie scattered over this state in most of its parts, and of the northern half of the United States, are objects of great curiosity, because they have evidently been transported a great distance. They are fragments of primitive rocks, granite, gneiss and Hornblende rock, which do not exist in place in Ohio, nor within about 400 miles in any direction.

As we go northward to the mountain ranges that skirt Lake Superior, we find the nearest rocks that answer to the specimens found here; and from this and other reasons, it is conclusively shown that they *are from the north.* In almost every quarry where the superficial earth has been stripped off, especially on the summits of hills, we find scratches, grooves and furrows, that are in a northerly and southerly direction, varying from N. 15° to N. 40° west. There is an evident connexion between the boulders and these diluvial furrows, and also with the drift or diluvium itself. It is supposed by some geologists that the drift and the boulders were brought on by the action of

glaciers of ice moving down from the north, in remote ages, when the northern hemisphere was, as the Alps are now, bound up in continual winter.

By others, that the waters of the Northern Ocean once stood several thousand feet higher than at present, and that by means of heavy currents in those ancient seas, the drift and boulders were brought on.

Others join the two theories, and suppose an elevated state of the waters and a great degree of cold, but not continual, as in the Alps, and currents of water acting in a double capacity as transporters of sand, clay and gravel, and of huge icebergs, that enclosed and brought along the rocks we now see.

By this supposition, a greater number of the phenomena of the drift can be explained than by the aqueous or the glacial alone. It is called the "aqueo-glacial" theory. The glacial explains how the scratches and furrows may have been formed, but by this the sands, clay and gravel should be mixed and in confusion, whereas we find them stratified; and more, we observe in Ohio and the west, that the boulders are *not mixed* with the superficial mass, but lie *upon* it, being spread over the surface.

By the aqueous doctrine, it does not seem probable that a force could be acquired sufficient to tear off and transport huge rocks many hundred miles; and if it could, should they not be mingled with the mass, and not rest upon it?

Icebergs are now seen floating in the ocean of many square miles in extent, and 2000 feet thick.

If the ocean or lake waters were elevated, so as to cover the highest land in Ohio, which is near the sources of Mad river, about 900 feet above the lake, or 1450 above the ocean, one of those largest icebergs would not float in the basin of Lake Erie. In Massachusetts, the same grooves, boulders and scratches which are seen here, are met with much *higher than any land in Ohio*, at 2400, 2600 and at 3200 feet above the level of the sea.

These facts show conclusively, either that the waters were higher, or the highlands lower than at present. If masses of ice existed then as now, and drifted southward, they would be likely to embrace fragments of the northern rocks, and in passing across our ranges of hills, would wear away the most exposed points, leaving scratches and furrows on the rocks.

The superficial deposits of Ohio are arranged into *four* geological formations, and, in the order of age, are as follows:

1st, The "ancient drift," resting upon the rocks of the state.

2d, The Lake Erie marl and sand deposits.

3d, The drift occupying the valleys of large streams, such as the Great Miami, the Ohio and Scioto.

4th, The "boulders," or, as it may be called, the "boulder stratum."

In these, we do not take into account the "alluvium," or earthy deposit, now going on, not as the result of an universal geological change, but by the action of floods, rains, bogs, vegetable decay, concretion, etc.

The "ancient drift," or drift formation, No. 1, of Ohio, has not, as I know, furnished any shells from which it can be determined whether it was of "*marine*" or salt water origin, or a "lacustrine" or fresh water deposit. It is distinctly stratified in the following order.

1*st.* At the bottom, *blue clay*, or "hard pan," with gravel stones, of both primitive and sedimentary rocks, and contains carbonate of lime. These gravel stones are not, in general, as much worn as in the superior strata, and are scratched and striated—thickness sometimes 150 feet.

2*d.* The *yellow clay*, or "hard pan," of the well-diggers, with gravel

stones similar to the "blue hard pan"—the stratum in general not as thick.

3*d*. Sand and gravel less perfectly stratified, and embracing more pebbles of the sedimentary rocks, such as limestone, sand stone, iron ore, coal and shale—the pebble more polished and rounded.

No. 1 of these divisions includes great numbers of logs, trees, leaves, sticks, and what the well-diggers call "grape vines." All these members occupy the surface at different places; but, in general, it is made up of Nos. 3 and 4. *Drift formation* No. 2, or the "Lake Erie deposits," are not satisfactorily *proved* to be newer than No. 1; yet the preponderance of evidence and all analogy are in favor of placing it above the "hard pans" in geological order. It is, however, often lower in natural level, occupying the basin of Lake Erie.

The section is as follows:

1st. From the lake level upwards, fine blue marly sand, 45 to 60 feet.

Its depth below the surface of the water is unknown—probably 50 to 100 feet, making a thickness of 95 to 160 feet.

2d. Coarse grey water-washed sand, ... 10 to 20 feet.

3d. Coarse sand and gravel, not well stratified, to surface, 20 to 50 "

The lake ridges from Erie to Norwalk belong to this stratum.

Stratum No. 1 of this formation is easily dissolved by the action of water, and it is upon this, being at the water level, that the principal encroachment of the lake is effected. It may be traced along the shore around the western half of the lake in Ohio, Michigan and Canada, everywhere undergoing loss by the perpetual movement of the waves, and sliding into the lake in heavy masses. It contains carbonate of lime, magnesia, alumina, iron, sulphur, silex, and a few decayed plants, sticks and leaves. There are also pebbles of primitive rocks, but they are not numerous. Its upper surface is almost horizontal, for the difference between the south shore at Cleveland and the north shore at Port Burwell, in Canada, does not exceed 15 feet. It is heavy and compact, so as to be impervious to water, causing numberless springs to flow out at its upper edges. In contact with water, it becomes quicksand, and is easily washed away. The coarse sandy stratum, No. 2, resting upon it, is porous, and suffers the water to settle through it readily. It is the same with No. 3, on the surface stratum or soil, occupying a long, narrow belt along the south shore, and also the broad and level region of southeastern Michigan and the western portion of "Canada West," between Lakes Erie and Huron.

The ridges of sand and sandy materials that are so common over all this space, appear to have been formed *beneath the surface* of the ancient waters, and were formerly parallel with the ancient shore.

They are seen at various levels above the lake, from 30 to 140 and 200 feet, but of greater length and regularity, is 90 to 120 feet. They were probably formed when the waters were at various heights, and by the same process that sand bars are now formed in the lakes and the ocean. Beneath the surface on the coast of the United States, opposite the states of New Jersey, Delaware, Maryland, Virginia and North and South Carolina. In Lake Erie, also, such ridges are known to form, having a general direction parallel with the shore. Should the water recede rapidly, or the bed of the ocean rise suddenly, they would be left in form and extent like our lake ridges. Similar ridges or terraces surround Lake Ontario. At Toronto, on the northern shore, Mr. Roy has given the elevation of several of them, referred to the lake level as follows. The base of the 1st, or nearest ridge to the

lake, 108 feet; 2d, 208 feet; 3d, 288 feet, and the highest near the summit, between Lakes Ontario and Simcoe, was found to be 680 feet, or 448 feet above Lake Erie. In Canada, those of the northern shore of Lake Ontario extend across the level region between Lake Erie and Lake Huron, forming there ridges that belong to Lake Erie. Examination will no doubt show, hereafter, higher ridges on the south shore of Lake Erie than those above given.

Formation No. 3 of the drift of Ohio, being that which is found in the valleys of large rivers and lowlands, but of greater extent and thickness than the alluvium, does not, so far as I know, possess within itself subdivisions of strata like formations Nos. 1 and 2. Its pebbles are numerous, and generally form rocks of a sedimentary kind. Pebbles of primitive rocks may be occasionally seen, but seldom. In the valleys of the Scioto and the two Miamies, rivers flowing in or near the limestone formation, the gravel is principally of limestone, well water worn and rounded.

The "Hickory Plains" at the forks of the White Water and Great Miami, and also between Kilgores mill and New Richmond, in Ross county, and in Pickaway county, are examples of this modification of the drift. It is probably the result of heavy diluvial currents, that exerted themselves irregularly during the *subsidence of the waters*, and acting in the direction of the great valleys.

The *fourth* and superior member of the drift, and the last action of the drift period, is the *boulder itself*. I call it a formation, because it appears to be due to a separate geological epoch, occurring after the three formations above noticed were in place. It may be called a *stratum*, for it covers a greater surface than any rocky stratum, and is disposed in regular order over all other deposits except the alluvial. At the best, it is not mingled with the subordinate beds, however it may be at Canada East and New England. It is the result of some force different from that which brought on the sands and clay. The boulders themselves must have been deposited in a short space of time, or they would have been found embedded in the drift. The waters must have retired soon after they were brought on, or the sediment would soon have covered them. They were probably dropped from masses of floating ice as the waters receded. But, in this sketch, it would be out of place to discuss the theories of the presence of the drift and the boulders.

In laying down the outlines of the grindstone grit, it should be observed, that, on the west, the junction between it and the fine grained sand stone is covered with drift, and, therefore, its limits are conjectural.

The grit and its shales appear to be in the form of a wedge between the conglomerate and the fine grained sand stone, which, as we go from the lake, diminishes in thickness, and is displaced by the Waverly thickening up.

This accounts for the appearance of the Waverly in the east fork of Rocky river, at Old Portage, and at Warren, Trumbull county, where its surface is higher than at the lake. Along an east and west line through these places, the surface of the Waverly, or fine grained sand stone, has been elevated by an upward increase of thickness.

VOCABULARIES OF THE SHAWANOESE AND WYANDOTT LANGUAGES, ETC.

[The following article was communicated for this work by the venerable Col. John Johnston, of Upper Piqua, Ohio, who, for about half a century, has been an agent of the United States over the Indians of the west. See page 363.]

The Wyandotts had resided on the soil of Ohio long before the French or English visited the country. Forty-six years ago, I took a census of them, when they numbered 2300 souls. In 1841 and 2, I was, as the commissioner of the United States, negotiating with them a treaty of cession and emigration, when it was found, by actual and accurate count, that, in a little less than 50 years, they had been reduced to the number of 800; none had emigrated—all that was left were the subjects of my negotiation. I had been their agent a great part of my life; and after being separated from them for 11 years by the power of the Executive, it fell to my lot, under the appointment of my honored and lamented friend and chief, President Harrison, to sign and seal the compact with their chiefs for their final removal from their cherished homes and graves of their ancestors, to which, of all their race, I had ever known they were the most tenderly attached, to the country southwest of Missouri.

The Shawnoese came into Ohio not long anterior to Braddock's campaign of 1754. They occupied the country contiguous to the Wyandotts, on the Scioto, Mad river, the Great Miami, and the upper waters of the Maumee of the lake, being in the light of tenants at will under the Wyandotts. They were their devoted friends and allies in all their wars with the white people—these two tribes having been the last of the natives who have left us, for there is not an Indian now in Ohio, nor an acre owned by one of their race within its limits.

I have thought that a specimen of the respective languages of these tribes might form a proper item in the history of a state so lately owned and occupied by the primitive inhabitants. The vocabulary, as far as it goes, is accurate, and may be relied upon. The reader will at once observe the great dissimilarity in the two languages, not one word in the whole being common to both. In all their large councils, composed of both tribes, interpreters were as necessary between the parties as it was between the Indians and the United States' officers. Not so with the Shawanoese, Delawares, Miamies, Putawatimies, Chippeways, Ottawas, Wee,as, Kickapoos and Piankeshawas—all of whom had many words in common, and clearly establishing a common origin. Almost all the tribes I have known, had tradition that that their forefathers, at some remote period, came from the west; and this would seem to strengthen the commonly received opinion of Asiatic descent. Many of the Indian customs, even at this day, are strictly Jewish: instance the purification of their women, the year of Jubilee, the purchase of wives, &c.

All the Indians have some sort of religion, and allege that it was given to their forefathers, and that it would be offensive to the Great Spirit to throw it away and take up with any other. They all believe that after this life is ended, they will exist in another state of being; but most of their sacrifices and petitions to their Maker are done with a view to the procuring of temporal benefits, and not for the health of the immortal part.

Death has no terrors to an Indian: he meets it like a stoic. The fate of the soul does not appear to give him the smallest uneasiness. I have seen many die, and some in full confidence of a happy immortality; such were not taught of the Christian missionaries. In innumerable instances I have confided my life and property to Indians, and never, in time of peace, was my confidence misplaced. I was, on one occasion, upwards of a week, in a time of high waters, alone, in the month of March, with a Delaware Indian in the woods, whom I ascertained afterwards to be a notorious murderer and robber; and having every thing about my person to tempt a man of his kind—a good horse, equipments, arms, clothing, &c.—and yet no one could be more provident, kind and tender over me than he was. When the chiefs heard that I had taken this otherwise bad man for a guide, they were alarmed until informed of my safety. I have had large sums of public money, and public dispatches of the greatest importance, conveyed by the Indians, without in any case suffering loss.

VOCABULARY OF THE SHAWANOESE.

One—Negate.
Two—Neshwa.
Three—Nithese.
Four—Newe.
Five—Nialinwe.
Six—Negotewathe.
Seven—Neshwathe.
Eight—Sashekswa.
Nine—Chakatswa.
Ten—Metathwe.
Eleven—Metath,we, Kit,en,e,gate.
Twelve—Metathwe, Kiteneshwa.
Thirteen—Metathwe, Kitenithwa.
Fourteen—Metathwe, Kitenewa.
Fifteen—Metathwe, Kitenealinwe.
Sixteen—Metathwe, Kitenegotewathe.
Seventeen—Metathwe, Kiteneshwathe.
Eighteen—Metathwe, Kitensashekswa.
Nineteen—Metathwe, Kitenchakatswe.
Twenty—Neesh,wa,tee,tuck,e.
Thirty—Nithwabetucke,
Forty—Newabetucke,
Fifty—Nialinwabetucke.
Sixty—Negotewashe.
Seventy—Neshwashe.
Eighty—Swashe.
Ninety—Chaka.
One hundred—Te,pa,wa.
Two hundred—Neshwatepawa.
Three hundred—Nithwatepawa.
Four hundred—Newe-tepawa.
Five hundred—Nialinwe-tepawa.
Six hundred—Negotewathe-tepawa.
Seven hundred—Neshwethe-tepawa.
Eight hundred—Sashekswa-tepawa.
Nine hundred—Chakatswe-tepawa.
One thousand—Metathwe-tepawa.
Two thousand—Neshina,metathwe,tepawa.
Three thousand—Nethina,metathwe,tepawa
Four thousand—Newena,metahwe tepawa.
Five thousand—Nealinwa metathwe tepawa.
Old man—Paapetotha
Young man—Meapeienea.

Chief—Okema.
Dog—Weshe.
Horse—Meshewa.
Cow—Methothe.
Sheep—Meketha.
Hog—Kosko.
Cat—Posetha.
Turkey—Pelewa.
Deer—Peshikthe.
Raccoon—Ethepate.
Bear—Mugwa.
Otter—Kitate.
Mink—Chaquiwashe.
Wild cat—Peshewa.
Panther—Meshepeshe.
Buffalo—Methoto.
Elk—Wabete.
Fox—Wawakotchethe.
Musk rat—Oshasqua.
Beavcr—Amaghqua.
Swan—Wabethe.
Goose—Neeake.
Duck—Sheshepuk.
Fish—Amatha.
Tobacco—Siamo.
Canoe—Olagashe.
Big vessel or ship—Misheologashe.
Paddle—Shumaghtee.
Saddle—Appapewee.
Bridle—Shaketonebetchega.
Man—Elene.
Woman—Equiwa.
Boy—Skillewaythetha.
Girl—Squithetha.
Child—Apetotha.
My wife—Neewa.
Your wife—Keewa.
My husband—Wysheana.
Your husband—Washetche.
My father—Notha.
Your father—Kotha.
My mother—Neegah
Grandmother—Cocumtha.

My sister—Neeshematha.
My bother—Neethetha.
My daughter—Neetanetha.
Great chief—Kitchokema.
Soldier—Shemagana.
Great soldier, as Gen. Wayne, } Kitcho, great, and Shemagana, soldier.
Hired man, or servant—Alolagatha.
Englishman—by the Ottawas, Sagona.
" by Putawatimies and Chippeways, the same.
" by the Shawanoese, Englishmanake.
Frenchman—Tota.
American—Shemanose, or big knives, first applied to the Virginians.
The lake—Kitchecame.
The sun—Kesathwa.
" by the Putawatimies, Chippeways and Ottawas, Keesas.
The moon—Tepeth,ka,kesath,wa.
The stars—Alagwa.
The sky—Men,quat,we:
Clouds—Pasquawke.
The rainbow—Quaghcunnega.
Thunder—Unemake.
Lightning—Papapanawe.
Rain—Gimewane.
Snow—Conee.
Wind—Wishekuanwe.
Water—Nip,pe.
" by the Putawatimies, Ottawas and Chippeways, Na,bish.
Fire—Scoate.
Cold—We,pe.
" Putawatimie, Sin,e,a.
Warm—Aquettata.
Ice—M'Quama.
The earth—Ake.
The trees, or the woods—Me,te,quegh,ke.
The hills—Mavueghke.
Bottom ground—Alwamake.
Prairie—Tawaskota.
Friend—Ne,can,a.
" in Delaware, N'tschee.
" in Putawatimie, Ottawa and Chippeway, Nitche.
River—Sepe.
Pond—Miskeque.
Wet ground, or swamp—Miskekope.
Good land—Wesheasiske.
Small stream—The,bo,with,e.
Poor land—Mel,che,a,sis,ke.
House—Wig,wa.
Council house, or great house—Takatchemaka wigwa.
The great God, or good spirit—Mishemenetoc.
The bad spirit, or the devil—Watchemenetoc.
Dead—Nep,wa.
Alive—Lenawawe.
Sick—Aghqueloge.
Well—Weshelashamama.
Corn—Da,me.
" by the Putawatimies, M'tame.
Wheat—Cawasque.
Beans—Miscoochethake.
Potatoes—Meash,e,tha,ke.
" by the Putawatimies, Peng,ack.
Turneps—Openeake.
Pumpkins—Wabegs.
Mellons—Usketomake.
Onions—Shekagosheke.
Apples—Me,she,me,na,ke.
Nuts—Pacanee.
Nut—Pacan.
Gun—Metequa.
Axe—Te,ca,ca.
Tomahawk—Cheketecaca.
Knife—Manese.
" by the Putawatimies, Comong.
Powder—Macate.
Flints—Shakeka.
Trap—Naquaga.
Hat—Petacowa.
Shirt—Peleneca.
Blanket—Aquewa.
" by the Putawatimies, Wapyan, or wabscat, wapyan, i. e. white blanket.
Handkerchief—Pethewa.
Pair of leggings—Me,tetawawa.
Eggs—Wa,wa,le.
Freshmeat—Weothe.
" by the Putawatimies, We,as.
Salt—Nepepimme.
" by the Putawatimies, Su,ta,gin.
Bread—Ta,quan,e.
" Putawatimies, Quasp,kin—a Shawanoese would say, Meet,a,lasqwa.
I have got no bread—Ta,qu,ana.
Kettle—A,coh,qua.
Sugar—Me,las,sa.
Tea—Shis,ke,wapo.
Medicine—Cho,beka.
I am very sick—Olame,ne,taghque,lo,ge.
I am very well—Ne,wes,he,la,shama,mo.
A fine day—Wash,he,kee,she,ke.
A cloudy day—Mes,quet,wee.
My friend—Ne,can,a.
My enemy—Matche,le,ne,tha,tha.
The Great Spirit is the friend of the Indians—Ne,we,can,e,te,pa, we,sphe,ma,mi,too.
Let us always do good—We,sha,cat,we,lo, ke,we,la,wapa.
Bell—To,ta,gin.
Plenty—Ma,la,ke,
Cut,e,we,ka,sa, or Blackfoot, the head chief of the Shawanoese, died at Wapoghkonetta in 1831, aged about 105 years.
She,me,ne,too, or the Snake, another aged chief, emigrated with the nation west.
Fort, or garrison—Wa,kargin.

SPECIMEN OF THE WYANDOTT, OR HURON LANGUAGE.

One—Scat.
Two—Tin,dee
Three—Shaight.
Four—An,daght.
Five—Wee,ish.
Six—Wa,shaw.
Seven—Soo,ta,re.
Eight—Ace,tarai.
Nine—Ain,tru.
Ten—Augh,sagh.
Twenty—ten,deit,a,waugh,sa.
Thirty—Shaigh,ka,waugh,sa.
Forty—An,dagh,ka,waugh,sa.
Fifty—Wee,ish,awaugh,sa.
Sixty—Waw,shaw,wagh,sa,
Seventy—Soo,ta,re,waugh,sa.
Eighty—Au,tarai,waugh,sa.
Ninety—Ain,tru,waugh,sa.
One hundred—Scu,te,main,gar,we.
The great God, or good spirit—Ta,main,-de,zue.
Good—Ye,waugh,ste.
Bad—Waugh,she.
Devil, or bad spirit—Deghshee,re,noh.
Heaven—Ya,roh,nia.
Hell—Degh,shunt.
Sun—Ya,an,des,hra.
Moon—Waugh,sunt,ya,an,des,hra.
Stars—Tegh,she.
Sky—Cagh,ro,ni,ate.
Clouds—Oght,se,rah.
Wind—Iru,quas.
It rains—Ina,un,du,se.
Thunder—Heno.
Lightning—Tim,mendi,quas.
Earth—Umait,sagh.
Deer—Ough,scan,oto.
Bear—Anu,e.
Raccoon—Ha,in,te,roh.
Fox—Th,na,in,ton,to.
Beaver—Soo,taie.
Mink—So,hoh,main,dia.
Turkey—Daigh,ton,tah.
Squirrel—Ogh,ta,eh.
Otter—Ta,wen,deh.
Dog—Yun,ye,nah.
Cow—Kin,ton,squa,ront.
Horse—Ugh,shut,te, or man carrier.
Goose—Yah,hounk.
Duck—Yu,in,geh.
Man—Air,ga,hon.
Woman—Utch,ke.
Girl—Ya,weet,sen,tho.
Boy—Oma,int,sent,e,hah.
Child—Che,ah,ha.
Old man—Ha,o,tong.
Old woman—Ut,sindag,sa.
My wife—Azut,tun,oh,oh.
Corn—Nay,hah.
Beans—Yah,re,sah.
Potatoes—Da,ween,dah.
Mellons, or pumpkins—O,nugh,sa.
Grass—E,ru,ta.
Weeds—Ha,en,tan.
Trees—Ye,aron,ta.
Wood—O,tagh,ta.
House—Ye,anogh,sha.
Gun—Who,ra,min,ta.
Powder—T'egh,sta.
Lead—Ye,at,ara.
Flints—Ta,wegh,ske,ra.
Knife—We,ne,ash,ra.
Axe—Otto,ya,ye.
Blanket—Deengh,tat,sea.
Kettle—Ya,yan,e,tith.
Rum—We,at,se,wie.
River—Ye,an,da,wa.
Bread—Da,ta,rah.
Dollar—Sogh,ques,tut.
Shirt—Ca,tu,reesh.
Leggins—Ya,ree.
Bell—Te,ques,ti,egh,tas,ta.
Saddle—Quagh.she,ta.
Bridle—Cong,shu,ree.
Fire—Sees,ta.
Flour—Ta,ish,rah.
Hog—Quis,quesh.
Big house—Ye,a,nogh,shu,wan,a.
Corn field—Ya,yan,quagh,ke.
Musk rat—Se,he,ash,i,ya,hah.
Cat—Dush,rat.
Wild cat—Skaink,qua,hagh.
Mole—Ca,in,dia,he,nugh,qua.
Snake—To,en,gen,seek.
Frog—Sun,day,wa,shu,ka.
Americans—Sa,ray,u,migh, or big knives.
Englishman—Qu,han,stro,no.
Frenchman—Tu,hugh,car,o,no.
My Brother—Ha,en,ye,ha.
My sister—A,en,ya,ha.
Father—Ha,yes,ta.
Mother—Ane,heh.
Sick—Shat,wu,ra.
Well—Su,we,regh,he.
Cold—Ture,a.
Warm—Ote,re,a,ute.
Snow—De,neh,ta.
Ice—Deesh,ra.
Water—Sa,un,dus,tee,the, the origin of Sandusky, the bay, river and county of that name.
Friend—Ne,at,a,rugh.
Enemy—Ne,mat,re,zue.
War—Tre,zue.
Peace—Scan,o,nie.
Are you married—Scan,dai,ye.
I am not married yet—Augh,sogh,a,sante,-te,sandai,ge.
Come here—Owa,he.
Go away—Sa cati,arin,ga.
You trouble me—Ska,in,gen,tagh,qua.
I am afraid—I,agh,ka,ron,se.
I love you—Yu,now,moi,e.
I hate you—Yung,squa,his.

I go to war—A,yagh,kee.
I love peace—Eno,moigh,an,dogh,sken,onie.
I love all men—Away,tee,ken,omie.
I have conquered my enemy—O,negh,e,ke,-wishe,noo.
I don't like white men—Icar,tri,zue,egh,har,-taken,ome,enu,mah.
Indians—I,om,when.
Negro—Ahon,e,see.
Prisoner—Yan,dah,squa.
He is a thief—Run,neh,squa,hoon.
Good man—Room,wae,ta,wagh,stee.
Fish—Ye,ent,so.
Plums—At,su,meghst.
Apples—Sow,se,wat.
Fruit—Ya,heeghk.
Sugar—Se,ke,ta. Honey—the same.
Bees—Un,dagh,quont.
Salt—Anu,magh,ke,he,one, or the white people's sugar.
Moccasin—Aragh,shee.
How do you do—Tu,ough,qua,no,u.
I am sorry—I,ye,et,sa,tigh.
I am hungry—Yat,o,regh, shas,ta.
You will be filled—E,sagh,ta,hah.
I am dying—E,hye,ha,honz.
God forgive me—Ho,ma,yen,de,zuti,et,te,-rang.
Auglaize river—Qus,quas,run,dee, or the falling timber on the river.
Blanchard's fork of the Auglaize—Quegh,-tu,wa, or claws in the water.
Sandusky—Sa,un,dus,tee, or water within water-pools.
Muskingum—Da,righ,quay, a town or place of residence.
Cayuhoga—Ya,sha,hia, or the place at the wing.
Miami of the lake—Cagh,a,ren.du,te, or standing rock at the head of the rapids of this river. There is in the middle of the stream a large elevated rock, which, at a distance, very much resembles a house. The place was named by the French Roche de Boef, and hence the standing rock river.
The sea of salt water—Yung,ta,rez,ue.
The lakes—Yung,ta,rah.
Detroit—Yon,do,tia, or great town.
Defiance, now the county seat of Defiance county, at the junction of the Auglaize and Miami of the lake—Tu,enda,wie, or the junction of two rivers. After defeating the Indians in 1794, Gen. Wayne, on his return, built Fort Defiance, thereby proclaiming defiance to the enemy.
Chillicothe town—Tat,a,ra,ra, or leaning bank. Chillicothe is Shawanoese, and is the name of one of their tribes.
Cincinnati—Tu,ent,a,hah,e,wagh,ta, a landing place, where the road leaves the river.
Ohio river—O,he,zuh,ye,an,da,wa, or something great.
Mississippi—Yan,da,we,zue, or great the river.

NAMES OF RIVERS BY THE SHAWANOESE—SPOKEN SHA,WA,NO.

Ohio, i. e. Eagle river.—See page 574.

Ken,a,wa—meaning having whirlpools, or swallowing up. Some have it that an evil spirit lived in the water, which drew substances to the bottom of the river.

Sci,o,to was named by the Wyandotts, who formerly resided upon it. A large town was at Columbus, having their cornfields on the bottom grounds opposite that city. The Wyandotts pronounce the word *Sci,on,to*, signification unknown.

Great Miamie—Shi,me,a,mee,sepe, or Big Miamie.

Little Miamie—Che,ke,me,a,mee,sepe, or Little Miamie.

Mus,king,um is a Delaware word, and means a town on the river side. The Shawanoes call it Wa,ka,ta,mo,sepe, which has the same signification.

Hock,hock,ing is Delaware, and means a bottle. The Shawanoese have it Wea,tha,-kagh,qua,sepe—Bottle river.

Auglaize river—Cow,the,na,ke,sepe, or falling timber river.

Saint Mary's river—Ca,ko,the,ke,sepe, or kettle river—cako,the,ke, a kettle.

Miamie of the lake—Ot,ta,wa,sepe, or Ottawa river. The Ottawas had several towns on this river as late as 1811, and down to within 10 years. They occupied the country about the lake shore, Maumee bay and the rapids above Perrysburgh.

Blanchard's fork of the Auglaize—Sha,po,qua,te, sepe, or Tailor's river. See p. 237.

Sandusky river—called by the Shawanoese Po,ta,ke,sepe, a rapid river.

Detroit strait, or river—Ke,ca,me,ge, the narrow passage, or strait.

Kentucky is a Shawanoese word, and signifies at the head of a river.

Licking river, which enters the Ohio opposite the city of Cincinnati—the Shawanoese have it, Ne,pe,pim,me,sepe, from Ne,pe,pim,me, salt, and sepe, river, i. e. salt river.

Mad river—by the Shawanoese, Athe,ne,sepe,athe,ne, a flat or smooth stone, and sepe, river, i. e. a flat or smooth stone river.

INDEX TO CITIES AND PRINCIPAL VILLAGES.

GENERAL INDEX.